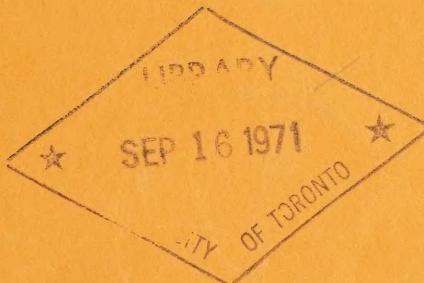


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Annual publications

Controlling Air Pollution In Metropolitan Toronto



Department of the Environment

Hon. George A. Kerr, Q.C., Minister

J.C. Thatcher, Deputy Minister

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CONTROLLING AIR POLLUTION IN METROPOLITAN TORONTO
PROGRESS REPORT

Introduction

The control and prevention of air pollution in Ontario became the full responsibility of the Ontario Government on January 2, 1968 when the Air Pollution Control Act, 1967 came into effect. Prior to that date, air pollution control had been under municipal jurisdiction. The province had functioned in an advisory capacity.

The Air Pollution Control Act is administered by the Air Management Branch of the Department of the Environment. The branch has the authority to conduct air quality and meteorological studies and monitoring programs, establish acceptable air quality levels, and to inspect and regulate all sources of air pollution.

One of the branch's major areas of concern has been Metropolitan Toronto. This report summarizes the progress the branch has made in its air management program for Toronto from January 2, 1968, when it assumed control, to December 31, 1970.

Summary of Air Pollution Control Progress in Metropolitan Toronto

The City of Toronto's first air pollution control measure was an anti-smoke by-law passed in 1907. Additional measures were subsequently adopted, but it was not until 1949 that an effective by-law for the control of black smoke was adopted, first by the City of Toronto and later, in 1957, by Metropolitan Toronto to include all of the then existing 13 Metro municipalities.

By 1968, when the province assumed control, 95% of Toronto's once serious black smoke problem had been eliminated. However, much remained to be done about other smoke and dust problems as well as about gaseous emissions from a wide variety of burning and other chemical processes.

Since January 1968 considerable progress has been made:

1. Abatement programs have been or are being established for most large stationary sources of air pollution. (By December 1970, 128 industrial abatements and 1,043 fuel conversions had been carried out.)

2. An air pollution index and alert system has been put into operation that allows the Minister of the Environment to curtail the operations of major sources of air pollution as certain index levels are reached.

3. A detailed survey of all sources of air pollution has been completed in connection with a specially developed mathematical model. When fully developed, the model will allow the Air Management Branch to evaluate strategies for the control of existing pollution problems and anticipate future ones.

4. Open burning has been banned, with the exception of recreational fires.

5. A new regulation restricting the sulphur content of fuels sold or used in the Metro area has been introduced, that will result in significant reductions of sulphur dioxide emissions.

The overall effect of these measures, in addition to other general provisions introduced under the Air Pollution Control Act, has been to put Metropolitan Toronto well on the way to achieving a satisfactory degree of air quality. As in the rest of Ontario, all new potential sources of air pollution must incorporate appropriate control systems. Within the next few years, virtually all existing sources will also be under control, emitting either no pollutants at all or pollutants at acceptable levels of concentration. When this degree of control will have been achieved, pollution build-ups will occur only under extremely stagnant weather conditions.

Sources of Air Pollution in Metropolitan Toronto

Stationary Sources

Five basic categories have been established for stationary sources of air pollution: industrial facilities, commercial and public buildings, schools, apartment buildings, houses. The following list indicates their numbers.

1. Large point sources	241
(A special grouping of large sources from all categories. Included are both the Hearn and Lakeview generating stations, large industries and hospitals, the Metro Toronto incinerators, large educational and other institutional facilities.)	
2. Intermediate industries	916
3. Large commercial institutions	199
4. Other commercial and public buildings	33,000
5. Schools	560
6. Apartment buildings	4,500
7. Houses	440,000

The elimination or reduction of air pollution from these sources is being accomplished in two basic ways.

1. Certain known sources, and others brought to the branch's attention by means of complaints, are approached directly and individual solutions are developed. Most involve the establishment of abatement programs by which emissions of pollutants are reduced to conform with emission standards under the Air Pollution Control Act. In some instances, owners of air pollution sources may instead decide to shut down their operations or relocate them.

Emission standards specifically indicate the amounts of pollutants (gases and dust particles) permitted to enter the atmosphere over fixed periods of time. Health effects and esthetic considerations play an important role in their determination. Legal action can be initiated if they or other aspects of a regulation are violated.

2. Special regulations, most of which apply to all of Ontario, are being made under the Air Pollution Control Act. Two regulations outline controls for specific types of industrial operations -- ferrous foundries and asphalt paving plants. A third, effective Jan. 1, 1971, is the regulation restricting the sulphur content of fuels used or sold in Metropolitan Toronto. A fourth is being prepared to govern the operation of apartment and commercial incinerators.

Mobile Sources

Four basic categories have been established for mobile sources of air pollution: motor vehicles (passenger cars, buses, trucks), ships, trains, aircraft.

Mobile sources present a difficult control problem, as only motor vehicles fall under the jurisdiction of the Air Pollution Control Act.

Motor Vehicles: At present exhaust emissions from all passenger cars and some types of trucks and buses are governed by regulations made under the Act.

The first of these regulations went into force at the beginning of the 1969 model year. As a result, 1970 passenger cars produce only 30% of the emissions that come from 1968 models. 1975 passengers cars will produce only five to ten per cent of 1968 emission levels. Regulations that would require the installation of anti-pollution devices in now uncontrolled motor vehicles are being considered.

Ships, Trains, Aircraft: All aspects of ship, train and aircraft operation fall under the jurisdiction of the Federal Government. Air pollution from these sources, therefore, cannot be regulated under Ontario's Air Pollution Control Act. The Air Management Branch can and does, however, enforce the existing federal provisions concerning air pollution from these sources.

Smoke emissions from ships in Canadian waters are regulated under the Canada Shipping Act. Smoke emissions from locomotives and other railway property are regulated by Canada General Order 0-26 issued by

the Board of Transport Commissioners for Canada. No regulations have been developed to control aircraft exhausts, although both Air Canada and CP Air have recently announced plans to substantially reduce black smoke emissions from a large number of their planes.

Measuring Air Pollution in Metropolitan Toronto

The Air Management Branch has established a province-wide air pollution monitoring system to locate and measure the concentrations of various pollutants. As of Jan. 1, 1971, 751 instruments were located in 44 communities. Of this number, 171 were spread across Metropolitan Toronto in 50 locations.

Primary pollutants measured are:

1. Sulphur dioxide, emitted primarily from industrial and power generating operations burning coal and oil with high sulphur content.
2. Suspended particulate matter, from a wide variety of operations producing large amounts of dust and smoke.
3. Carbon monoxide, primarily from motor vehicles.
4. Hydrocarbons, primarily from motor vehicles.
5. Oxides of nitrogen, primarily from power generating operations and motor vehicles.

Available data up to the end of 1969 indicates that air quality in Metropolitan Toronto has improved substantially in the past few years, and very greatly since the 1950's.

Sulphur dioxide: The concentration of sulphur dioxide in downtown Toronto decreased from an annual average of 9 parts per hundred million in 1967 to 6 p.p.h.m. in 1969, a drop of 33 per cent. Annual averages for suburban areas in 1969 were approximately one half of the downtown average.

The level of sulphur dioxide established as a desirable goal under the Air Pollution Control Act is an annual average of 2 p.p.h.m. Existing levels will be reduced steadily to meet this figure as more air pollution abatement programs come into effect.

The Hearn Generating Station's partial fuel conversion from coal to natural gas (scheduled for the end of 1971) will on its own decrease sulphur dioxide emissions in Metropolitan Toronto by 22%. In addition, the new 700 foot stack will disperse pollutants over a wider area, to further reduce ground level concentrations.

Suspended particulate matter: Concentrations of suspended particulate matter have also been decreasing. This is directly indicated by the results of two standard forms of measurement:

1. the Soiling Index, a measure of fine dust particles in the air based upon an optical method of calculation.
2. weight by volume, expressed in micrograms per cubic metre, which includes particulate matter of all sizes.

The Soiling Index decreased in the City Hall area from an average of 0.7 in 1967 to 0.4 in 1969, a drop of approximately 43% in fine dust concentration. At the University of Toronto monitoring site the Index decreased from 0.8 in 1967 to 0.6 in 1969, a drop of 25% for that location.

The Soiling Index reading established as a desirable goal under the Air Pollution Control Act is 0.45, a figure that has now been reached in most of Metropolitan Toronto.

The level of all particulate matter has also decreased, although not to the same degree as fine particulate matter.

Figures available from another downtown monitoring station (67 College St.) show drops in averages from 194 micrograms per cubic metre in 1962 to 168 micrograms per cubic metre in 1967 to 138 in 1969. The desirable goal under the Air Pollution Control Act is 60 micrograms per cubic metre. Continued pollution abatement will bring total particulate levels closer to this figure.

Some idea of how high previous levels of suspended particulate matter once were in Toronto is indicated by the fact that in 1957 the Soiling Index averaged 2.35 at the University of Toronto and 5.08 at the John St. Pumping Station (Front and Bathurst Streets). It is estimated that with a reading of 5.00, visibility is approximately one mile. An Index of 1.00 corresponds with visibility of 20 miles.

Carbon monoxide, hydrocarbons, oxides or nitrogen: Adequate measurements of these pollutants prior to 1968 are not available for Metropolitan Toronto. Continuous monitoring of all three, however, has been

carried out in various locations for the past three years.

Available figures for 1968 and 1969 are not sufficiently adequate for projecting trends, but in general the concentrations of these pollutants compare favorably with air quality criteria established under the Air Pollution Control Act. These criteria will be more consistently met in the future with increased abatement of stationary sources and better control of motor vehicles.

Abating Air Pollution In Metropolitan Toronto

The actual locating and abatement of air pollution sources is the work of the Abatement Section of the Air Management Branch. This activity is conducted from 15 offices located across the province in seven regions. Six of the regions encompass varying numbers of southern counties or northern districts. The remaining region is Metropolitan Toronto, set aside on its own because of population (approximately 2,000,000) and a high concentration of air pollution sources. Abatement staff in the Toronto region includes 23 engineers and inspectors.

In Toronto, as elsewhere in Ontario, pollution sources are being dealt with on a priority basis aimed first of all at the control of large industrial and institutional point sources. In each case, an emission survey is made of the operations. The owner is then given a written report outlining the control measures required, a stated time in which to submit an application for a Certificate of Approval, and a compliance time for correction.

The aim of abatement programs is to stop emissions of air contaminants if possible, or reduce them to acceptable levels of concentration. Acceptable levels in each instance and therefore the degree of actual control depend upon the location of the source, the type of pollutant emitted, and the expected adverse effect upon receptors downwind from the source.

The overall abatement goal is the elimination of air pollution as it is defined in the Air Pollution Control Act, 1967 -- "...the presence in the outdoor atmosphere of any contaminant or contaminants in quantities that may cause discomfort to or endanger the health or safety of persons, or that may cause injury or damage to property or to plant or animal life, or that may interfere with visibility or the normal conduct of transport or business."

Not all air contaminants, of course, can be eliminated. At low levels of concentration under most weather conditions, however, they are dispersed into the atmosphere. Pollution build-ups will continue

to occur even after all air pollution sources have been brought under control (i.e., emitting pollutants in allowable quantities), but only during prolonged periods of stagnant weather.

The following table summarizes abatement activity in Metropolitan Toronto from Jan. 2, 1968 to Dec. 31, 1970.

	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>Total</u>
Industrial abatements	19	45	64	128
Fuel conversions	220	240	583	1,043
Inspections & surveys	1,300	2,800	10,106	14,206
Observations	36,200	21,000	7,926	65,126
Complaints received	2,500	3,100	5,023	10,623

Industrial Abatement:

1. the relocation or elimination of a source of pollution, or
2. the reduction of the effects of emissions from a source by means of process alteration or installation of additional equipment.

Fuel conversion: change-over from the burning of coal or high sulphur content oil to natural gas or low sulphur content oil.

The 128 industrial abatements and 1,043 fuel conversions are the result of specifically negotiated programs worked out between the Air Management Branch and the owners of air pollution sources. Eighteen programs have been carried out under Minister's Orders because of size or special problems attached to them.

As of Dec. 31, 1970, abatement programs were being prepared for 102 other air pollution sources across Metropolitan Toronto. In addition, 75 other known sources were scheduled for future investigation and control.

Inspection: visual examination of actual operation and equipment (e.g., apartment building incinerators).

Survey: complete examination (including process calculations) of an air pollution source.

Inspections and surveys have increased in number as abatement activity has been steadily broadened and staff increased.

Observation: outdoor sighting of smoke emissions or the encountering of odors, either during routine district tours or as the result of a complaint or other specific suggestion to observe a particular situation.

Observations were naturally high in number in 1968 and 1969 because of general visual surveys initially conducted to record the overall extent of Toronto's air pollution problem. Their decrease in number in 1970 also reflects the increasing number of fuel conversions and abatement programs being completed.

Complaint: phone call or letter received about discomfort or damage due to air pollution (smoke, soot, odors) which is subsequently investigated by an inspector.

A complaint service was established across the province to help define the pollution problems of known sources and to reveal unknown sources. The number of complaints received has increased as the public has become more aware of the service.

Air Pollution Index and Alert System

A significant aspect of Ontario's air management program is its air pollution index and alert system. The index was established to give warning of and to prevent the adverse effects of air pollution build-ups during prolonged periods of stagnant weather. At the end of 1970 it was in operation in Toronto and Hamilton. Since then it has been extended to include Sudbury and Windsor.

The index is based upon continuous measurements of sulphur dioxide and suspended particulate matter, Ontario's two major air pollutants. Both have been found in high concentrations during severe air pollution episodes in other parts of the world, and extensive data is available relating severity of health effects to degree of pollution.

The structure of the index is a numerical scale beginning at 0. Readings below 32 are considered acceptable, indicating concentrations of sulphur dioxide and suspended particulate matter that should have little or no effect on human health. At 58, people with chronic respiratory disease may be affected. At 100, prolonged conditions could have mild effects on healthy people and serious effects on those with severe cardiac or respiratory disease.

The alert system functions at four index levels: 32 (Advisory Level), 50 (First Alert), 75 (Second Alert), 100 (Air Pollution Episode Threshold Level).

At 32, if meteorological conditions are expected to remain unfavorable for at least six more hours, owners of major sources of air pollution may be advised to prepare for possible curtailment of their operations. At 50, under continuing adverse meteorological conditions, they can be ordered to curtail them.

At 100, the Minister of the Environment can order all sources of air pollution not essential to public health or safety to cease operations. A reading of 100, however, is unlikely to ever be reached because of previous provisions for curtailment at lower index levels.

The highest Toronto index reading in the past, calculated in retrospect from measurements taken at the time, would have occurred between November 30 and December 4, 1962. The index would have reached a peak of 155 during the evening of December 1, and 125 during the early morning hours of December 4. The average reading over this four day period would have been 95.

The most significant aspect of this particular pollution build-up was a dense smog which caused that year's Grey Cup game to be played on two separate days. There was no recorded increase, however, in hospital admissions of people with respiratory ailments during this period, an indication of the margin of safety built into the index.

The Air Pollution Index and Related Abatement Activity in 1970

The index went into operation in Toronto on March 23, 1970. Between then and December 31, the Advisory Level of 32 was exceeded on 17 occasions and the First Alert Level of 50 was exceeded twice. Highest index reading in 1970 was 56 on October 8.

Abatement activity on these occasions began as the index reached 32 with telephone calls to the larger sources of air pollution on the API Calling List. (The list is a record of all air pollution sources emitting at least 4,000 pounds of either sulphur dioxide or suspended particulate matter a week. Approximately 50 sources are listed at any given time.)

In each case, the owner or operator of the source was advised of the index level and requested to prepare for possible curtailment of his operation. Many, however, responded immediately and actually reduced operations while the index was still at 32. Such co-operation, especially when the index was rising rapidly and unfavorable weather conditions were expected to continue for some time, helped prevent the index from rising to 50 except on the two occasions mentioned.

When the index rose to 56, the Minister of Energy and Resources Management (now Minister of the Environment) issued Ministerial Orders instructing 20 air pollution sources to reduce their respective emissions of either sulphur dioxide or suspended particulate matter.

Operations emitting large amounts of sulphur dioxide (e.g., Hearn Generating Station) are able to reduce emissions by either cutting back production or switching to a lower sulphur content fuel. Operations producing large amounts of suspended particulate matter (e.g., the Metropolitan Toronto incinerators) can only reduce emissions by cutting back production.

Function of the A.P.I. Calling List

As already indicated, the A.P.I. Calling List functions as a ready guide for the Air Management Branch when immediate abatement action is required due to high index readings. By having the larger sources of pollution reduce emissions, a pollution build-up can usually be checked.

Actual composition of the list varies from month to month. Operations not previously on the list are added when their emissions exceed either 4,000 pounds of sulphur dioxide or suspended particulate matter a week. Operations on the list are removed when their emissions fall below this level because of abatement programs or for other reasons.

Some sources of air pollution on the list are operating in accordance with design standards established under the Air Pollution Control Act. They are, in other words, emitting contaminants at allowable rates but, because of size, their total emissions exceed 4,000 pounds a week.

The allowable rate of emission for a given contaminant from a particular source is determined by (1) calculating what the subsequent concentration of an emitted contaminant will be point of contact with an object that could be adversely affected by it (man, animals, vegetation, buildings), and (2) comparing that concentration with the design standard or maximum concentration allowed for the contaminant. If the calculated concentration is too high, modifications become necessary to reduce the amount of contaminant being emitted at the source.

The point of contact mentioned above is referred to as the "point of impingement". It is the point of contact between a plume or

effluent stream and an object that might be adversely affected. It can occur at ground level or above (e.g., the side of a building).

Concentration figures at point of impingement are averages calculated for periods of 30 minutes. The maximum concentration allowed for a given contaminant is well below that at which adverse effects would actually occur.

The maximum allowable concentration of sulphur dioxide at point of impingement is 0.3 parts per one million parts of air by volume averaged over a period of 30 minutes. The maximum allowable concentration of suspended particulate matter at point of impingement is 100 micrograms per cubic metre of air averaged over a period of 30 minutes.

An important factor influencing the composition of the list is the use of natural gas as a fuel. When burned, natural gas produces only minute traces of sulphur dioxide, and numerous operations are being converted to it to reduce emissions of this pollutant. At the present time, however, there is a general shortage of this fuel and it is only available on a year round basis to essential services. Other operations are restricted to its use on an "interruptible basis". They are supplied with natural gas for most of the year except during a mutually agreed upon interruptible period when they must burn another fuel, normally oil. The interruptible period varies in length from five to 90 days and usually occurs in the winter months when fuel demands are highest.

This procedure has an obvious influence on the A.P.I. Calling List. An operation burning natural gas on an interruptible basis will not, of course, be on the list while actually using the fuel, but it may be during its interruptible period. Whether or not it will be depends upon both the amount and sulphur content of the coal or oil being used in place of natural gas.

Abatement Progress of 20 Metropolitan Toronto Firms and Institutions

During the high API Episode in October, 1970, Ministerial Orders were issued to 20 firms and institutions in Metropolitan Toronto, and their names were released to the public. A list of the 20 follows below, with a brief indication of the abatement status of each two months later, on December 31, 1970.

Eighteen of the firms and institutions received Ministerial Orders because of sulphur dioxide emissions. Two received Orders because of suspended particulate emissions. The relevant pollutant is given after each name on the list.

Many of the sources on the list have taken significant abatement action since October 1970. Some already had abatement programs in progress, and their names have been removed from the A.P.I. Calling List.

The names of the 20 firms and institutions were announced in the Legislature on October 31, 1970, by George A. Kerr, then Minister of Energy and Resources Management. At the time, he made certain important remarks about the circumstances under which the Orders were issued.

Mr. Kerr's statement is as follows, as recorded in Hansard, October 13, 1970, page 4889:

Hon. Mr. Kerr: "Mr. Speaker, I wish to table the list of the firms and institutions in Toronto and Hamilton which were served with Ministerial Orders last week during the air pollution incident. There were orders issued against 20 institutions in Toronto, and, I believe, 28 in Hamilton. And these were issued because the readings contained in those cities exceeded 50."

"It should be pointed out, Mr. Speaker, that the owners of these sources are not necessarily villains; they were chosen because of the size of their emissions, which are more a function of the size of

their operations than an indication of a lack of conscience. Many of them are on a very extensive control programme required by the Air Management Branch.

"The emissions from several of them already meet Ontario's provincial standards. However, during these adverse weather conditions, curtailment of air pollution emissions is the only thing that will keep air quality from reaching dangerous levels. The emissions from the multitude of smaller sources are also significant, but due to the large number of them it is impractical to endeavour short-notice curtailment.

"Long-range abatement programmes in both these cities, and regulations covering the sulphur content of fossil fuels and automobile emissions will reduce the incidence of high levels of air pollution in Ontario cities."

The 20 firms and institutions that received Ministerial Orders in October 1970 are as follows:

1. Metropolitan Toronto - Incinerators (suspended particulate matter). Surveys of Metro's seven incinerators have been completed and abatement requirements are being prepared. An overall program with completion dates attached will be finalized during the first half of 1971.
2. Ontario Hydro - Hearn Generating Station (sulphur dioxide). An abatement program has been established. It includes the building of a 700 foot stack to be operational by December 31, 1971, and the conversion to natural gas. Four units will be fired by natural gas by spring, 1971; the other four by the end of 1971.

Four units will burn gas exclusively; four will burn gas on an interruptible basis. During the interruptible period when natural gas will not be available to the four units, low sulphur content coal will be used instead.

-Lakeview Generating Station (sulphur dioxide).

A joint study is being conducted of this operation.

3. E.S. and A. Robinson (sulphur dioxide). An abatement program is under way. The incinerator was shut down on November 16, 1970 and boiler operations will be switched to natural gas in the near future (date not yet finalized).
4. Canadian SKF Company (sulphur dioxide). The company has converted to a low sulphur content fuel and has been removed from the API calling list.
5. C.P.R. Yards, Agincourt (sulphur dioxide). The yards are operated under Federal Government jurisdiction. The Minister of Energy and Resources Management therefore has no legal control over its operations. Co-operation is good, however, and discussions concerning the reduction of boiler plant emissions are under way.
6. Goodyear Tire and Rubber Co. (sulphur dioxide). A test program is under way to establish more efficient burning, thereby eliminating a soot problem. The company reduces steam production during high API readings.
7. Campbell Soup Co. (sulphur dioxide). The company is converting to natural gas in the spring of 1971. In the meantime, the company is burning low sulphur content oil during high API readings.
8. Anaconda Brass Ltd. (sulphur dioxide). An abatement program is being negotiated. For now, the company reduces steam production during high API readings.
9. McGuiness Distillers Ltd. (sulphur dioxide). Steam production is reduced during high API readings.
10. T. Eaton Company Ltd. - Downtown Store (sulphur dioxide). The company has discontinued operation of its downtown incinerator and boiler plant. It now purchases steam from the Toronto Hydro Steam Plant which is fuelled by natural gas and low sulphur content oil. As a result, the store has been removed from the API calling list.

11. Molson Breweries (sulphur dioxide). A fuel change is under discussion. The company is presently negotiating a low sulphur content fuel contract to be removed from the API calling list.
12. Lever Brothers (sulphur dioxide). The company has converted to natural gas on an interruptible basis with low sulphur content oil as a standby fuel. It will not appear on the API calling list except possibly during its interruptible period.
13. Domtar Chemicals Ltd. - Tar and Chemical Division (sulphur dioxide). The company is burning some of its own by-product with a low sulphur content on an availability basis (75% of the time.) It burns higher sulphur content fuel at other times, except during high API readings when a switch is made back to low sulphur content fuel.
14. Lambert Lodge (sulphur dioxide). The lodge has been switched to a lower sulphur content oil and removed, as a result, from the API calling list.
15. Wellesley Hospital (sulphur dioxide). The hospital has been partially converted to natural gas on an interruptible basis with low sulphur oil as a standby fuel. It will be completely converted to natural gas by the spring of 1971. The hospital has been removed from the A.P.I. calling list.
16. Toronto General Hospital (sulphur dioxide). The hospital's incinerator has been discontinued. A new heating plant burning natural gas on an interruptible basis with low sulphur content oil as a standby fuel will become operational in the spring of 1971. The plant includes a new 450 foot stack.
17. Massey Ferguson Ltd. (sulphur dioxide). An abatement program is under discussion. For now, the company reduces steam production during high API readings.
18. Maple Leaf Mills Ltd. (suspended particulate matter). An abatement program is under discussion. For now, the company reduces

grinding operations, grain handling, boat loading and unloading upon request.

19. Toronto Terminal Railways, Union Station (sulphur dioxide).

This installation is owned jointly by the C.N.R. and C.P.R. and is operated under Federal Government jurisdiction. An abatement program is under discussion. For now, steam production is reduced during high A.P.I. readings.

20. York University (sulphur dioxide). A fuel change is under consideration. The University, in the meantime, switches immediately to low sulphur content oil when the index reaches 32.

Metropolitan Toronto's Mathematical Model

The complexity of air pollution problems in large urban areas has necessitated the development of a computerized mathematical model for Metropolitan Toronto. Designed by the Air Management Branch in conjunction with H.H. Angus and Associates and the Research Corporation of New England, it consists of three segments:

1. an information system containing pertinent facts about pollution sources (location, pollutants emitted, fuels burned, hours of operation, etc.); meteorological and topographical data; demographic data (land use zoning policies, transportation plans, traffic information); health and damage data (short and long term effects of air pollution on people, animals, vegetation and materials).
2. a wind generation routine for processing meteorological data.
3. a simulation model by which climatic conditions and sources and amounts of pollution can be related to provide indications of actual air quality.

The model will be operational early in 1971. If fully successful, it will enable the Air Management Branch to evaluate different abatement strategies for existing pollution sources and predict changes in air quality resulting both from the construction of new sources and the implementation of new regulations (e.g., those governing automotive exhaust emissions and fuel sulphur content).

The model will also function as a valuable electronic filing system of air management facts allowing quick summary of any required data. In particular, it will enable the branch to provide rapid and complete information to municipal developmental agencies (planning boards, etc.) that wish to incorporate air management factors within urban and regional planning studies.

Fuel Sulphur Content Regulation

A special regulation limiting the sulphur content of fossil fuels used, sold or offered for sale in Metropolitan Toronto has been introduced because of the area's high concentration of fuel burning operations. It reduces the maximum sulphur content of fuel oil (grades 1, 2, 4, 5, 6C) and bituminous coal within a phased program on the following dates: Jan. 1, 1971; Jan. 1, 1972; Jan. 1, 1973.

Sulphur content limits effective Jan. 1, 1971, range from 0.5 per cent for No. 1 fuel oil to 2.0 per cent for bituminous coal. The final limits, effective Jan. 1, 1973, will be 0.5 per cent for fuel oils 1 and 2, and 1.5 per cent for fuel oils 4, 5, 6B, 6C, and bituminous coal.

Implementation of the regulation will substantially reduce emissions of sulphur dioxide in Metropolitan Toronto. Further sulphur content reductions will be considered after the effects of existing restrictions have been analyzed using the mathematical model.

Summary

The basic methods of controlling air pollution have been established and implemented with considerable success in Metropolitan Toronto over the last three years as reflected by decreasing levels of pollutant concentrations. Abatement programs, fuel conversions, special regulations and the air pollution index and alert system have all played a role, and will continue to do so as air quality is steadily improved.

The work ahead consists of continued control and prevention, greater refinement of techniques, and the more direct application of the knowledge gained from air pollution control work to the actual planning and development of urban areas. In this regard, the mathematical model will play an important role and will increasingly be a factor in the day to day work of air management.

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